Marburg and Lassa viruses

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Situation analysis of laboratory-based surveillance system for Ebola and other VHF in Thailand

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Viruses causing hemorrhagic fever

- *Filoviridae*: Ebola and Marburg
- *Arenaviridae*: Lassa fever, Junin and Machupo
- *Bunyaviridae*: Crimean-Congo haemorrhagic fever, Rift Valley fever, Hantaan haemorrhagic fever
- *Flaviviridae*: yellow fever, dengue, Omsk haemorrhagic fever, Kyasanur forest disease
Common characteristics of viruses causing HF

• Enveloped virus with RNA genome
• Wide range of natural hosts: zoonotic diseases and some are vector-borne viruses
• Geographically restrict
Symptoms of VHF

- Specific signs and symptoms vary by type of VHF, but the initial signs and symptoms is nonspecific and difficult to provide differential diagnosis.

- Initial symptoms: high fever, fatigue, loss of strength, muscle aches
VHF in Africa

- Yellow fever virus
- Lassa fever virus
- Marburg virus
- Ebola virus
- Crimean-Congo hemorrhagic fever virus
Family *Filoviridae* is classified into 2 genera:

- Genus *Marburgvirus*
- Genus *Ebolavirus*
Marburg virus

• First discover in 1967 in Marburg and Frankfurt, Germany and in Belgrade, Serbia (Yugoslavia)

• Source of infection: African Green monkeys from Uganda
Marburg hemorrhagic fever outbreak

• Germany and Yugoslavia 1967
• South Africa (origin from Zimubwe ?) 1975
• Kenya 1980, 1987
• DR Congo 1998-2000
• Angola 2004-2005
• Uganda 2007, 2012

• 1990 Lab contamination in Russia
• 2008 USA and Netherlands ex Uganda
Transmission

• Fruit bats, *Rousettus aegypti* of the family *Pteropidae* are reservoir hosts.
• Transmission from bats to human may occur through contact with bat feces or aerosols.
• Transmission from primates
• Human to human transmission: contact to blood, secretions, body fluids/tissues, semen or contaminated equipment (household contact, nosocomial infection, burial ceremony)
Pteropid bats
Marburg hemorrhagic fever

• Incubation period 5-10 days
• High fever, severe headache, severe malaise, severe watery diarrhoea, abdominal pain and cramping. Nausea and vomiting can begin on the third day.
• Fresh blood in vomitus and feces, bleeding from nose, gum and vagina. Spontaneous bleeding at venepuncture site
• CNS involvement
• Death occurs most often on between day 8 and 9, and usually preceds by severe blood loss and shock.
• Case fatality rate 23-90%
General properties of filovirus

- RNA genome of negative polarity, linear
- Envelope
- Filamentous shape
- Carry enzyme RNA dependent RNA polymerase in virion
Lab diagnosis

- RT-PCR
- Ag detection
- Ab detection by ELISA/NT assay
- Virus isolation in cell culture
Figure 30.3 Phylogenetic analysis of Old and New World arenaviruses using nucleocapsid (N) gene sequences. The New World viruses are divisible into at least three clades. (Modified from Clegg, 2002.)


Arenaviruses

- Enveloped virus with single stranded RNA genome comprising 2 RNA segments: S and L. The genome is ambisense.
- Presence of transcriptase in virion
- S RNA segment (3400 bases) encodes for nucleocapsid protein (N) and glycoprotein.
- L RNA segment (7000 bases) encodes for RNA polymerase.
Lassa fever virus

- It is endemic in West Africa in Sierra Leone, Liberia, Guinea and Nigeria.
- Cases reported from Ivory coast, Mali, Ghana.....
- Estimated number 100,000 to 300,000 cases with approximately 5,000 deaths per year.
Reservoir host of Lassa virus is a rodent known as the "multimammate rat" (*Mastomys natalensis*).
Transmission

- *Mastomys* rodents live in savannas and forest and around home. Rodents shed the virus in urine and droppings.
- Man gets infection through ingestion and inhalation.
- Human to human transmission through contact with blood, secretions, excretion and tissues and also nosocomial infection.
- Incubation period 1-3 weeks
Signs and symptoms

• Approximately 80% of Lassa fever virus infection are mild and undiagnosed.

• Mild symptoms include mild fever, general malaise and weakness. 20% of the cases progress to severe disease and hemorrhage, repeated vomiting, facial swelling, pain in chest, back and abdomen and shock. Deafness is the most common complication.

• Death occurs from multi-organ failure.

• Fatality rate 1% or 15-20% of hospitalized cases
Treatment

- Ribavirin given at early illness.
Lab diagnosis

• Same as mentioned for Marburg